



August 21, 2006

FILED ELECTRONICALLY

Ms. Marlene H. Dortch, Esq.
Secretary
Federal Communications Commission
445 12th St. SW
Washington DC 20554

Re: **EX PARTE** in Wireless Operations in the 3650-3700 MHz Band, ET Docket No. 04-151; Rules for Wireless Broadband Services in the 3650-3700 MHz Band, WT Docket No. 05-96

Dear Ms. Dortch:

On August 17, 2006, Mary L. Brown and Peter Ecclesine of Cisco Systems, Inc. met with the following FCC staff concerning the above captioned docket: Julius Knapp, Alan Scrim, Rashmi Doshi, Geraldine Matisse, Thomas Stanley, David Furth Jennifer Salhus, Martin Liebman, Ahmed Lajouji Ron Chase, and Eli Johnson.

Cisco has previously supported the Commission's rules as adopted.¹ The purpose of this ex parte meeting was to provide Cisco's view of the status of IEEE 802.11 standards on operations in the 3650-3700 MHz band,² and to reconfirm Cisco's view that the rules for this band, awarding nationwide non-exclusive licenses for technology that can meet technical requirements specified in the Report and Order, should be affirmed. As the discussion below makes clear, Task Group "Y" (TGy) is well on the way to finalizing a standard based on the FCC's existing rules. Significant attention is being given not just to current uses by incumbents in the band, but also to future changes by primary licensees of their operations. As a result, the standard for 3650-3700 MHz is being shaped with robust cognitive radio feature functionality, including dynamic frequency selection and transmit power control. Current issues under discussion are mobile enablement using base station beacons, as well as technology to sense other 802.11 transmissions, other technologies operating the band (e.g., energy detect) and clear channels.

Cisco stressed that significant economic activity around 802.11 technology generally, and strong participation by manufacturers in the standards process for TGy,

¹ Cisco Opposition to Petitions for Reconsideration, filed August 11, 2005.

² The views expressed in our meeting, and discussed in this filing, are Cisco's alone. These views do not represent the IEEE or any of its component parts.

suggests that there is a high level of interest in producing equipment for future users of the band. Based on the most current information available to us, standards-based 802.11 equipment that fully complies with existing FCC regulations could be in the market as soon as 2008. In the discussion, below, we explain our views. Attached is the powerpoint we used in the meeting with staff.

Current FCC rules

In the Report and Order and Memorandum Opinion and Order issued on the 3650-3700 MHz band on March 16, 2005, the Federal Communications Commission adopted a new set of rules governing operations in the band. In addition to incumbent satellite services and federal radiolocation stations, which are treated as primary, the Commission agreed to allow “lightly licensed” terrestrial operations.

The Commission crafted a few technology mandates on the terrestrial services the band:

- Mobile devices are limited to a peak EIRP of 1 watt over a 25 megahertz bandwidth.
- Fixed power density is limited to a maximum of 25 watts per 25 megahertz bandwidth.
- Mobile stations are permitted, but the base station must transmit a beacon signal that the mobile station must receive and decode before it can transmit.
- Fixed station antennas are not limited to a particular design, provided that the power density rule is met.
- To avoid interference among terrestrial transmitters, the technology used shall be equipped with contention-based protocols. No specific technology was mandated, although the Commission noted that 802.11 devices currently use a contention-based protocol known as Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA). Contention-based protocols shall be developed by industry to meet the following definition:

A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel. (Report and Order, para. 58)

- Emission limits to the adjacent spectrum is set at a minimum attenuation of $43 + 10 \log(P)$

Timeline of IEEE activity

In April 2005, IEEE 802 accepted a proposal from IEEE 802.11 to begin a Study Group to evaluate the Commission’s decision in 3650-3700 MHz. The purpose of a

study group is to determine if there is a task that needs to be resolved by way of a draft standard. The conclusion of the Study Group was to recommend a project for IEEE 802.11 to modify the standard to allow operation in the 3650 MHz band.

In November 2005, based on activity in the Study Group, the Study Group initiated a request for an IEEE 802.11 Task Group. As approved by the IEEE New Standards Committee in March 2006, the purpose of the working group is to develop standardized medium access control (MAC) and Physical Layer Specifications (PHY) for 3650-3700 MHz operations in the United States. That working group has now been constituted as “Task Group y” or “TGy”. When TGy’s work is complete, it will produce a standard that will allow shared 802.11 operation with other users in 3650-3700 MHz in compliance with FCC regulations.

TGy has held five teleconference calls and two sets of face-to-face meetings. At its in-person July 2006 session, it elected as Permanent Chairman Peter Ecclesine of Cisco Systems. Its last set of face-to-face meetings drew between 20-50 attendees. TGy continues to actively work on an 802.11 standard for this band, holding biweekly conference calls and planning face-to-face meetings in September in Melbourne, Australia and in November in Dallas, Texas. Although most 802.11 standards reach closure in three years, Cisco believes it may be possible to complete work on a letter ballot of the Working Group this fall. Following a letter ballot by the 802.11 Working Group, the standard will proceed to a sponsor ballot for all of IEEE. ISO 8802-11 procedures are used for the sponsor ballot to enable the final standard to be a world standard. As a result, for example, the world standard could be used in Canada, which has just released a consultation on 3650. A completed standard is possible as early as December 2007.

What the standard will do

The future TGy protocol will define procedures for initiating transmissions, determining the state of the channel (available or unavailable), and managing retransmissions in the event of a busy channel. Dynamic Frequency Selection will allow transmitters to assess if channels are in use by others, and to change frequency and bandwidth. Transmission Power Control based on EIRP will allow transmitters to change power.

As a basis for its new standard, the group is working from the text of 802.11j, a standard specific to Japan that also utilizes a 50 megahertz wide band. The group has tentatively decided (by a vote of 22-1) to employ non-overlapping channels with a 5 MHz guardband on the band edge. Channels of 5, 10, and 20 megahertz are permitted. The working draft standard includes three specific “regulatory class numbers” that will define, by the three channel sizes, the legal requirement for operation. At present, the draft standard provides for fixed or mobile operations. There is also coverage class for outdoor use so that outdoor stations that are distant from each other can contend for use of spectrum – this is an 802.11j approach in which MAC timing is adjusted for air propagation delay to allow multiple stations to use the medium.

In Cisco's view, the 802.11 standards development work for the 3650-3700 MHz band is very straightforward in that much of the standards can be borrowed from existing standards or the technology exists. Significantly, we see no need to change the MAC and broadband chipsets for devices in the 3650-3700 MHz band relative to existing 802.11g and 802.11n devices. This is significant because chipset development, if required, takes time. In this band, implementation of 802.11 devices will largely be about how the existing radios are tuned and the specific software they will contain.

Open issues

While significant work has been done in TGy, other issues remain open, and may be resolved this fall. The group has begun discussing the issue of mobile enablement and has heard a presentation on how to resolve this. To enable mobility of transmitters in the band, the group is discussing the following concepts:

- A registered location is contained in every beacon signal transmitted by a base station. (An 802.11 base station could cover up to 300 square miles at the power levels the Commission has established.)
- There is a hierarchy of control – the mobile client device is dependent upon the base station. If a client is associated to its normally registered base station, the client has to re-hear an enabling signal from the base, and signal that it is now dependent on that base station. Should interference occur, the licensed and registered base station operator has the capacity to turn off the mobile device. It can do that in two ways: (1) by turning off all the mobiles associated with it; or (2) use specific messages to the interfering mobile.
- An “agreement bit” would tell transmitters to “check your authority to operate” – e.g., things are different than when the device was manufactured, such as the introduction of new primary users.

A second set of issues involves coexistence with WiMax technology, Clear Channel Assessment/Energy Detect, and Carrier Sense Multiple Access/Collision Avoid. The group has already decided a portion of this issue, finding that it wants to improve clear channel assessment for coexistence relative to today's 802.11 technology, by moving to -82 dBm, a level that is 20dBm more sensitive to other transmitters than existing IEEE 802.11 standards. This will ensure that the future devices in this band will treat detected energy as if the other energy is another 802.11 transmission.

Drafts of the standard and TGy reports are publicly available on the Internet at <ftp://ftp.802wirelessworld.com/11/06/>. Key documents would include 0855r3, which is the draft standard and 1024r2, which constitute the tentative minutes of the July meeting.

IEEE 802.11 and other technologies

Adoption of a new IEEE 802.11 standard for 3650 -3700 MHz does not foreclose other technologies from operating in the band, provided they can meet the basic technical requirements set forth in the FCC's decision.³ Cisco strongly supports the Commission's decision to avoid a technology mandate for the band. We noted, in response to questions from staff, that the current standards for 802.16 do not provide for technology that can share the band with 802.11. In sum, 802.16 today is a technology to be deployed by licensed, geographically exclusive service providers. In contrast, 802.11 technology will have the capability the Commission articulated in the Report and Order to dynamically share available spectrum, while avoiding primary licensees in the band.

Exclusive geographic area licensing unnecessary

Based on our view of the standards and technology capabilities that IEEE 802.11 will bring to the table, the FCC model of a non-exclusive nationwide "light licensing" regime will work well for potential users of this band. Cisco urges the Commission to affirm the rules that were adopted for the band in 2005. We understand that WiMax supporters are zealously pursuing an opportunity for geographically licensed WiMax in this spectrum because spectrum close to this particular band is available for wireless broadband in most other countries. But in the U.S., the band is encumbered with satellite and governmental uses. In our experience, geographically licensed service providers are often more interested in spectrum that is available on a nationwide basis as opposed to spectrum containing exclusions for some of the largest metropolitan areas. For example, there is strong interest from the service provider community in broadband spectrum at 2.1 GHz, 2.5 GHz, and in 700 MHz.

At 3650-3700 MHz, in contrast, there is strong interest from Wireless Internet Service Providers whose business plans do not require large regional or national footprints. Moreover, enterprise users see a critical need for this spectrum to augment their over-taxed private land mobile radio networks. Finally, 802.11 brings with it an enormous ecosystem of manufacturers. More than 200 companies belong to the Wi-Fi Alliance, a group that certifies IEEE 802.11 devices for interoperability. More than 120 million 802.11 chipsets were shipped worldwide in 2005. One industry analyst firm estimates that the worldwide market for wireless local area network devices will top \$3.4 billion in 2006.⁴ The market is strong and expanding. For example, as with Internet routers generally, wireless local area network routers will increasingly be supporting real-time services, such as voice. In addition, voice handsets will increasingly be offered in a "dual mode" with traditional licensed cellular service. Even more powerful and faster broadband access is becoming available, with data rates of up to 100 megabits, as the 802.11n standard is finalized in 2007. In our view, intensive use of the band for broadband access does not require exclusive geographic licensing.

⁴ Dell'Oro Group, WLAN Forecast, July 28, 2006.

Conclusion

The well-established IEEE 802.11 community is far along in preparing standards and technology that will exceed the Commission's requirements for this band. The Commission's 2005 decision created a new opportunity to build upon cognitive feature functionality in 802.11 radios, and the industry is responding. While there is and should be a place for geographically licensed, exclusive use spectrum for service providers, the future also belongs to cognitive radio devices that will require new users to politely and opportunistically share un-used spectrum with incumbent licensees. The 3650 MHz band is spurring that revolution. We ask that the Commission affirm its prior decision.

Sincerely,

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